

1. Earth: A unique Planet

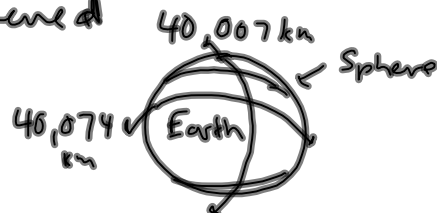
I. Earth Basics

A. Earth is unique compared to other planets in our solar system because it has H_2O (water)

1. Earth it is the 3rd planet from the sun
2. Earth formed 4.6 billion years ago
3. 71% of Earth's surface is covered with water
 - a. Global ocean - the thin layer of water that covers Earth's surface

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4. Earth appears to be a sphere but is technically an oblate spheroid - or slightly flattened



5. Earth's pole -

pole to pole circumference is 40,007 km
while the equatorial circumference is 40,074 km

II Earth's interior

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- A. Direct observation of the Earth's interior has limited and primarily informed by drilling
- B. Due to the difficulty of making direct observations regarding Earth's interior, we have primarily relied upon indirect methods to study Earth's interior
 - 1. Scientists have made important discoveries about Earth's interior from
 - seismic waves: vibrations that travel through Earth (earthquakes + explosions make seismic waves)

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- C. Compositional Zones of Earth's interior
 - 1. Crust - the thin, solid, most outermost zone of Earth
 - a. Crust beneath the ocean is the oceanic crust
 - b. the part of the crust that makes up the continents is called the continental crust
 - C. the lower boundary of the crust is called the Mohorovicic discontinuity or Moho

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2. Earth's mantle - the layer that underlies the crust, which is denser than the crust
 - a. makes up $\frac{2}{3}$ of Earth's mass
 3. The center of the Earth is a spherical mass of iron and nickel called the core
- P. Structural zones of the Earth's interior - the 3 compositional zones of Earth's interior are divided into 5 structural zones

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1. Lithosphere - The solid outer layer of Earth that consists of the crust and the rigid part of the mantle
2. Asthenosphere - The solid, plastic layer of the mantle beneath the lithosphere
 - made of rock the flows very slowly, which allows tectonic plates to move on top of it
 - a. Plasticity - the ability of a solid to flow

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3. Mesosphere - literally, the "middle sphere" the strong, lower part of the mantle between the asthenosphere and the outer core
4. Outer core - believed to be a dense liquid
5. Inner core - a dense, rigid solid
 - a. both the outer core and the inner core combine to make up $\frac{1}{3}$ of Earth's mass

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- III Earth as a magnet
 - A. Earth has two magnetic Poles (North + South)
 1. Earth's magnetic field extends beyond the atmosphere and affects a region in space called magnetosphere
 2. Earth's magnetic field is believed to be from the iron in Earth's outer core
- IV Earth's gravity,

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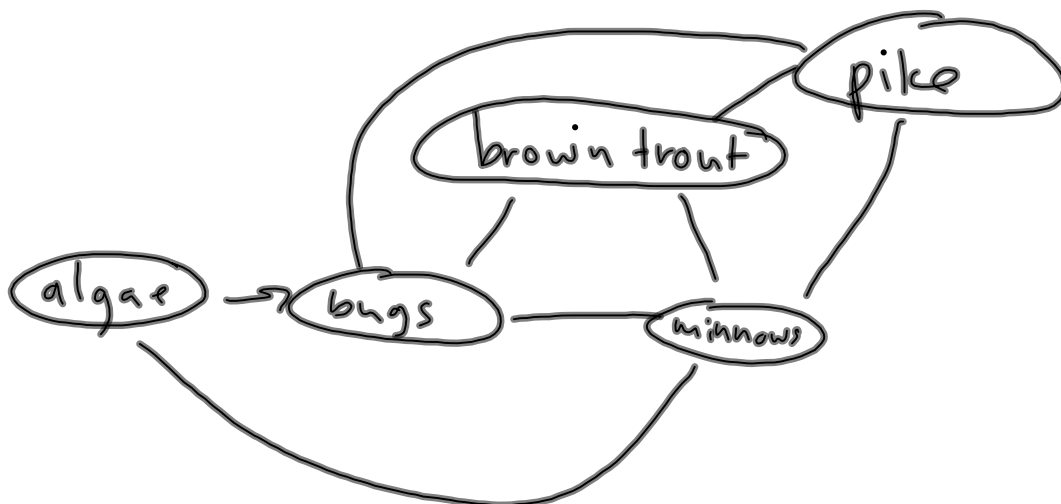
A. Gravity - the force of attraction that exists between all matter in the universe

1. Newton described this with his law of gravitation

2. Mass vs. weight

3. Weight and location

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2.2 Energy in the Earth System

A. System - an organized group of related objects or components that interact to create a whole

1. Operation of the Earth System is a result of interaction between matter and energy

a. Matter - anything that has mass and takes up space

b. Energy - the ability to do work

B. Closed System - a system in which energy but not matter is exchanged with its surroundings

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C. Open System - a system in which both energy and matter are exchanged with the surroundings

Closed vs ~~Open~~

Open Systems

1. Figure 2

D. The Earth System

1. Technically, all systems that make up Earth System are open

a. However, Earth system is almost closed because very little matter is being exchanged is limited

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II Earth Four Spheres-

A. Matter on Earth is solid, liquid, and gaseous states

1. There are four spheres that are "store houses" of all the planet's matter

B. The Atmosphere - the blanket of gases that surrounds Earth's surface

1. The Earth's Atmosphere is 78% Nitrogen, 21% Oxygen, and 1% other gases (Ar, CO₂, H₂O, He)

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C. The Hydrosphere - water covers 71% of Earth

1. All H₂O, except H₂O in atmosphere, is in the hydrosphere

D. The Geosphere - the mostly solid part of Earth

1. Geosphere includes rock and soil

E. The Biosphere - composed of all the forms of life in the geosphere, the hydrosphere, and atmosphere

III Earth's Energy Budget

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A. Exchanges and flow of Energy on Earth Happen in predictable ways

1. 1st Law of Thermodynamics - energy is transferred between systems but is neither created nor destroyed

2. Transfers of Energy between Earth's spheres is part of the "energy budget"

3. 2nd Law of thermodynamics - when energy transfer takes place, matter becomes less organized w/ time

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B. Internal Sources of Energy

1. Earth's interior (core) is warmer than the surface (crust), and hot materials move towards the surface in a process called convection

C. External Energy Sources

1. Sun is Earth's most important external energy source

a. Figure 5

III Cycles in the Earth System

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A. Reservoir - a place or energy or matter is stored

B. Cycle - a group of processes in which matter and energy repeatedly moves through a series of reservoirs

C. Nitrogen Cycle

Figure 6

1. Nitrogen must be altered, or fixed, before organisms can use it
2. In a cycle, N moves from air to soil, from soils to plants/animals, and back to air

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D. The carbon (C) Cycle

1. Carbon moves through all spheres
2. part of the C cycle is short term

Figure

7

- plants convert CO_2 into carbs like glucose ($\text{C}_6\text{H}_{12}\text{O}_6$)
- organisms break down carbs and release some carbon as CO_2 into the air
- organisms also release carbon into the air through organic wastes, decay of their remains release CO_2 or CH_4 (methane)

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- b. Long-term cycle in which carbon moves through Earth's four spheres happens when C in the geosphere is buried, plant or animal remains in rock called carbonate, like limestone

E. The Phosphorus (P) Cycle

1. During the P cycle, P moves from every space except the atmosphere, P is rarely a gas
2. P enters the soil + H_2O when rocks break down in H_2O and P dissolves in H_2O

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- a. Plants absorb H_2O w/ P
- b. Animals absorb the P when eat the plants
- c. When animals die, they return P to the environment when they decompose

F. The Water (H_2O) cycle

1. Water cycles through Earth system through, Transpiration, Evaporation, Precipitation, and Condensation
 - a. Evaporation - occurs when energy is absorbed by liquid H_2O and energy changes H_2O into H_2O vapor

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b. Transpiration - is the release of moisture from plants

c. Condensation . occurs when H_2O loses energy it forms H_2O droplets (clouds)

d. precipitation - the release of H_2O after enough H_2O condenses in the cloud

V

Humans and the Earth System

A. All natural cycles can be affected / altered by human activities

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2.3

I. Ecology

A. One area where Life Science (Biology) and Earth Science are linked

B. Ecology - the study of the complex relationships between living things and their nonliving, or abiotic, environment

C. Ecosystem - a community of organisms and the environment that the organisms inhabit

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- D. Earth's ecosystems contain a variety of plants and animals
1. Organisms that make their own food are producers
 2. Organisms that get their energy by eating other organisms are consumers
 3. Some organisms get energy by breaking down dead organisms called decomposers
 - a. Decomposers are also a consumer

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- ## II Balancing Forces in Ecosystems
- A. Organisms in an ecosystem use matter + energy
1. Because matter and energy are limited, population growth within the ecosystem is limited
 2. The largest population an ecosystem can support is the carrying capacity
- ## III Ecological Responses to Change
- A. Changes in any part of the ecosystem may affect the entire system in unpredictable ways

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1. However, ecosystems generally are able to react to changes in order to keep the system healthy
2. Sudden change to an ecosystem is called a disturbance
3. However, sometimes the disturbance is too great to allow life to restore

IV Energy Transfer

- A. The ultimate energy source for almost every ecosystem is the sun

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1. Plants capture solar energy by a chemical process called photosynthesis
- B. The Ecological Food Pyramid starts w/ producers and ends w/ top end consumers (ex: carnivores)

V Food Chain + Web

- A. The sequence of how organisms consume other organisms can be represented by a food chain
- B. A food web is used to describe the complex relationships between multiple food chains
→ Figure 3 (p. 41)

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- VI Human Stewardship of the Environment
1. Earth's systems are interconnected and therefore any changes in one system can affect another Earth System
 - ! Ecological balances can be disrupted by human activity

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Chapter 2 Review

Grade: 9th
Subject: Earth Science
Date: 10/09/12

Oct 9-9:30 AM

1 An open system exchanges only energy with its surrounding

True

False

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2 The lithosphere is...

- A the solid outer layer of Earth that consists of the crust and the rigid upper mantle
- B the portion of Earth that is water
- C the solid, plastic layer of the mantle

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3 The part of Earth where life exists is the _____

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4 A community of organisms and their abiotic environment is a(n) _____

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5 A closed system exchanges energy and matter with its surroundings

True

False

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6 The mesosphere is...

- A the strong, lower part of the mantle between the asthenosphere and the core
- B a mixture of gases that surrounds a planet or moon
- C the mostly, solid rocky part of earth

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7 What is the closest value to the average circumference of Earth in KM?

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8 The mostly solid, rocky part of Earth is the geosphere....

True

False

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9 The transfer of energy throughout an ecosystem begins with the planet's capture of energy through photosynthesis

True

False

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10 Ecosystems respond to environmental change by dying out.

True

False

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